Materials Microcharacterization Collaboratory

http://tpm.amc.anl.gov/MMC

Security & Remote Operation of Microscopes and Beamlines

March 18, 1998

James A. Rome – ORNL

ARGONNE National Laboratory · BERKELEY LAB · NIST · ornl · University of Illinois Urbana-Champaign

The MMC Environment

- The MMC includes five different resource centers (microscopes + beam lines)
- The user community is distributed through the U.S. and abroad
- Users require high-bandwidth, secure access but may not be able to buy much equipment or software
- Nestor Zaluzec conducted a microscopy list server user survey...

ARGONNE National Laboratory
BERKELEY LAB
NIST
ornl
University of Illinois Urbana-Champaign

Demographics of Prospective Users

	Edu	Com	Gov	Org	Individuals
Organization	51%	24%	19%	3%	3%

	USA	Rest of the World
Location	67%	33%

Platform:	**World Wide**	**USA Only**	**Operating Systems**
PC Based	293 (47%)	206 (41%)	Win 95 (~98%),Win NT(<1%), Win 3.1(<1%)OS/2 (< 1%)
Mac Based	279 (45%)	251 (49%)	Mac OS V 7.5xx (100%)
Unix Based			
SUN	36 (~6%)	32 (~6%)	Solaris Note: 2 sites account for 20 systems!
SGI	10 (~2%)	9 (~2%)	SGI
IBM RS	6(~1%)	6(~1%)	not specified
DEC	2 (<1%)	2 (<1%)	not specified
HP	1(<<1%)	1(<<1%)	not specified
NEXT	1(<<1%)	1(<<1%)	Next
Total CPU's	**628**	**508**	

ARGONNE National Laboratory

BERKELEY LAB

NIST

ornl

University of Illinois Urbana-Champaign

Demographics of Prospective Users

	Edu	Com	Gov	Org	Individuals
Organization (first 100 sites)	51%	24%	19%	3%	3%

	USA	Rest of the World	Totals
Location	67%	33%	100%
CPU's	508 (81%)	120 (19%)	628 (100%)

	Modem	ISDN	≥T1	SiteWide (Speed Unknown)
Internet Connection	13(13%)	7(7%)	28(28%)	51(52%)

	Yes	No or Unknown
Firewall On-Site	26%	74%

	CuSee Me	Intel ProShare	PicTel	Vic/Vat	All Others
Video Conferencing	17	3	3	2	3

	NetScape	MicroSoft IE	All Others
Browser	87%	12%	3%

(some sites run multiple types of browsers hence totals exceed 100%)

ARGONNE National Laboratory

BERKELEY LAB

NIST

ornl

University of Illinois Urbana-Champaign

Cross-platform is required

- From the survey (~1 year old), almost all users have Macs or PCs. A new survey is in progress and we suspect that more now use PCs.
- A manufacturer survey at the Cleveland microscopy show revealed that they were all switching to Windows NT for microscope control.
- Unix-based solutions will not suffice.

ARGONNE National Laboratory · BERKELEY LAB · NIST · ornl · University of Illinois Urbana-Champaign

Security and networking

With million-$ instruments on line, security is a necessity.

- Fast, transparent encryption
- Secure multicast for conferencing and group collaboration
- Accurate and fast knowledge of who is accessing our devices from across the net

Certificates are the key to achieving above

ARGONNE National Laboratory
BERKELEY LAB
NIST
ornl
University of Illinois Urbana-Champaign

Certificate requirements

- Fast access to certificate servers
  - Certificates must be checked
- Policy engines must check authorization
- Reliability. If the servers are not up, the user is denied access.

There can a significant amount of overhead to set up a circuit for a short transaction.

http://mmc.epm.ornl.gov/~jar/MMCCerts.html

ARGONNE National Laboratory BERKELEY LAB NIST ornl University of Illinois Urbana-Champaign

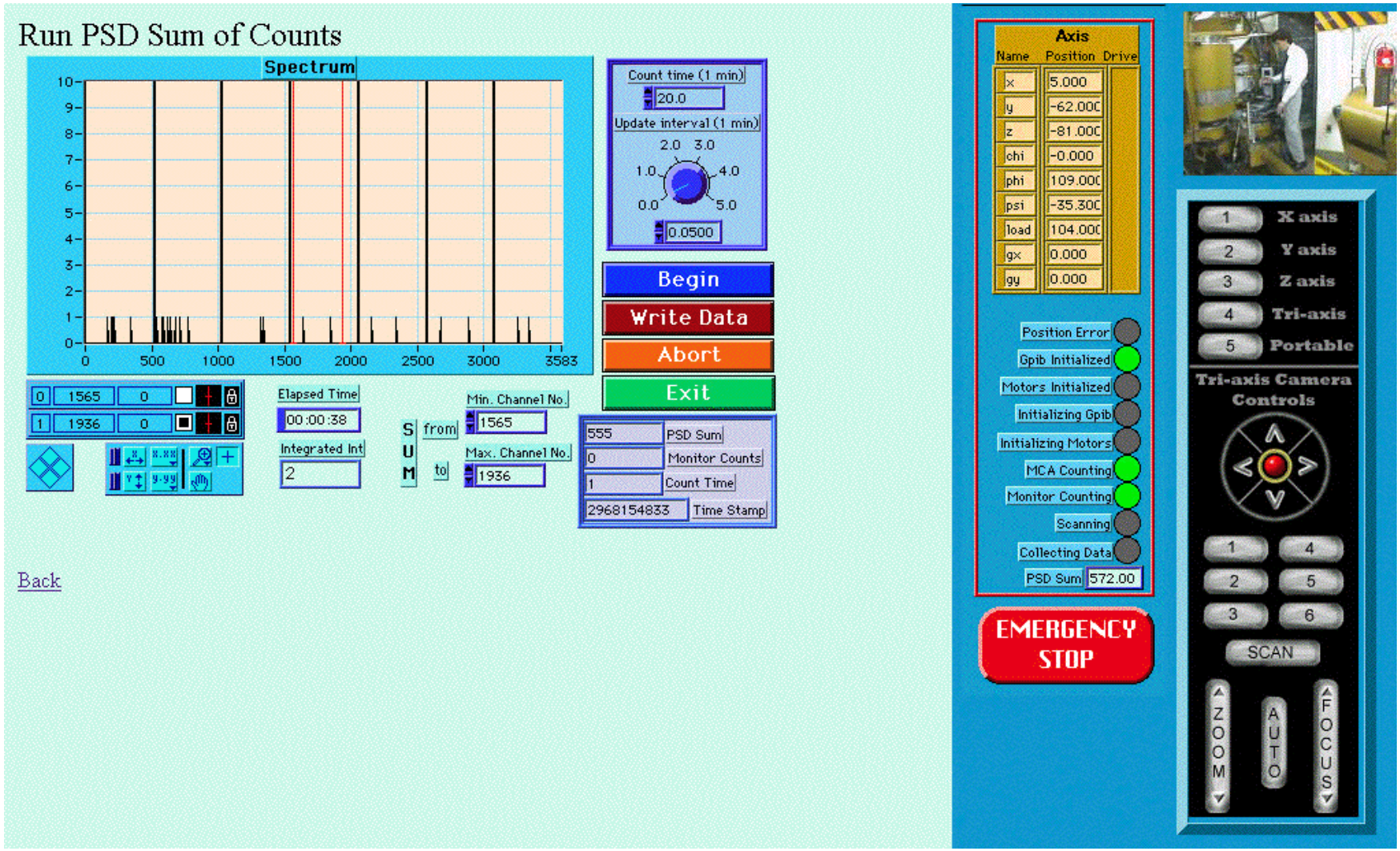
Implementation approaches (1)

After much soul-searching, we have decided that it is impossible to do everything via Web-based access.

- Legacy equipment may not have the necessary hooks
- Existing software is highly integrated, has complicated GUI interfaces which would be lost. E.g., click on image to move or zoom. Why reinvent the wheel?

ARGONNE National Laboratory · BERKELEY LAB · NIST · ornl · University of Illinois Urbana-Champaign

Beamlines are not microscopes



ARGONNE National Laboratory

BERKELEY LAB

NIST

ornl

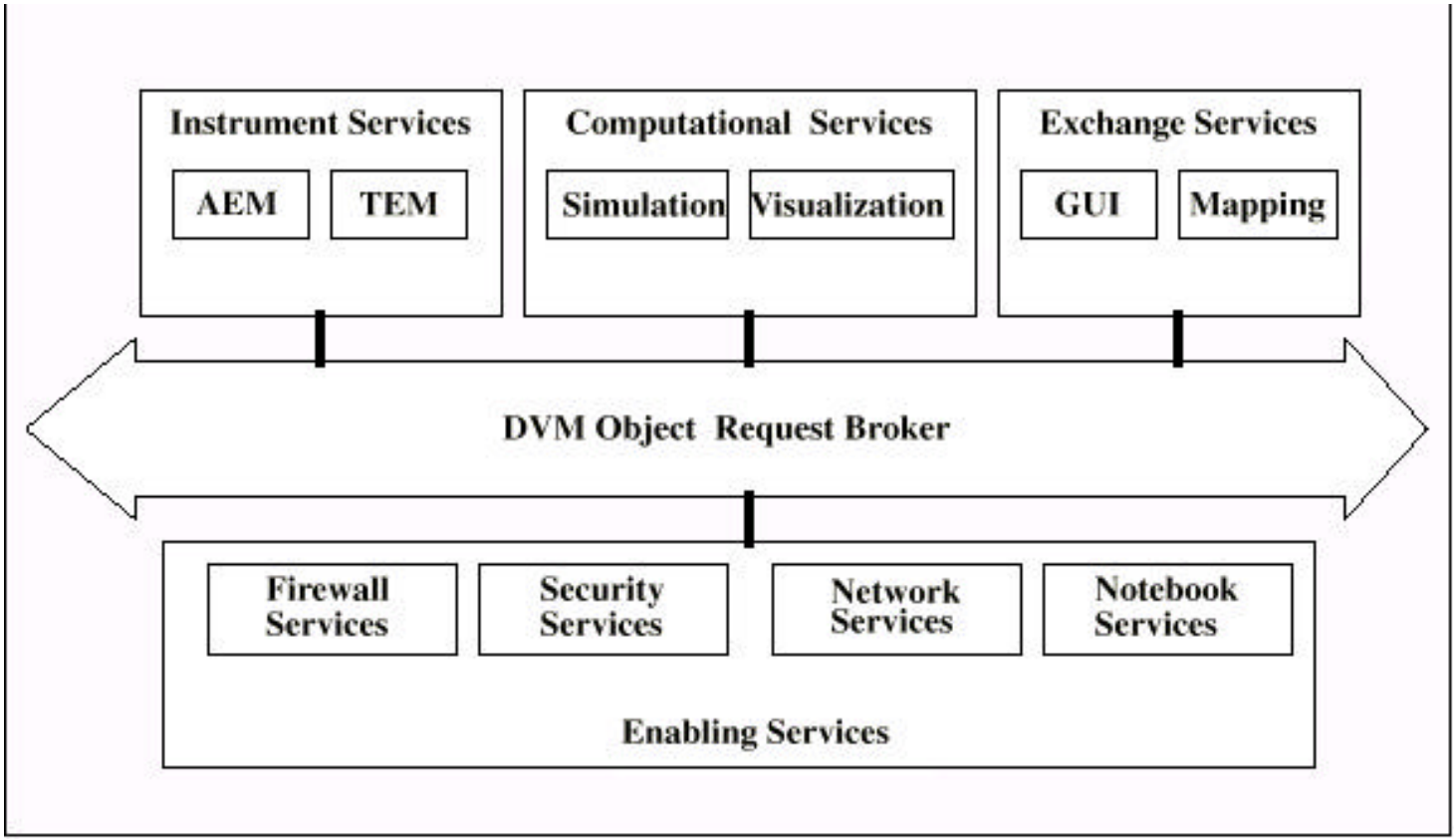
University of Illinois Urbana-Champaign

Implementation approaches (2)

Remote control programs (e.g., Timbuktu, PC Anywhere32) work for some systems, but,

- Encryption methods proprietary
- If the bitmap microscope image is part of the transmission, it chokes because none of the remote access programs know how to compress it enough
- No hooks for our security authentication

Implementation approaches (3)



ARGONNE National Laboratory

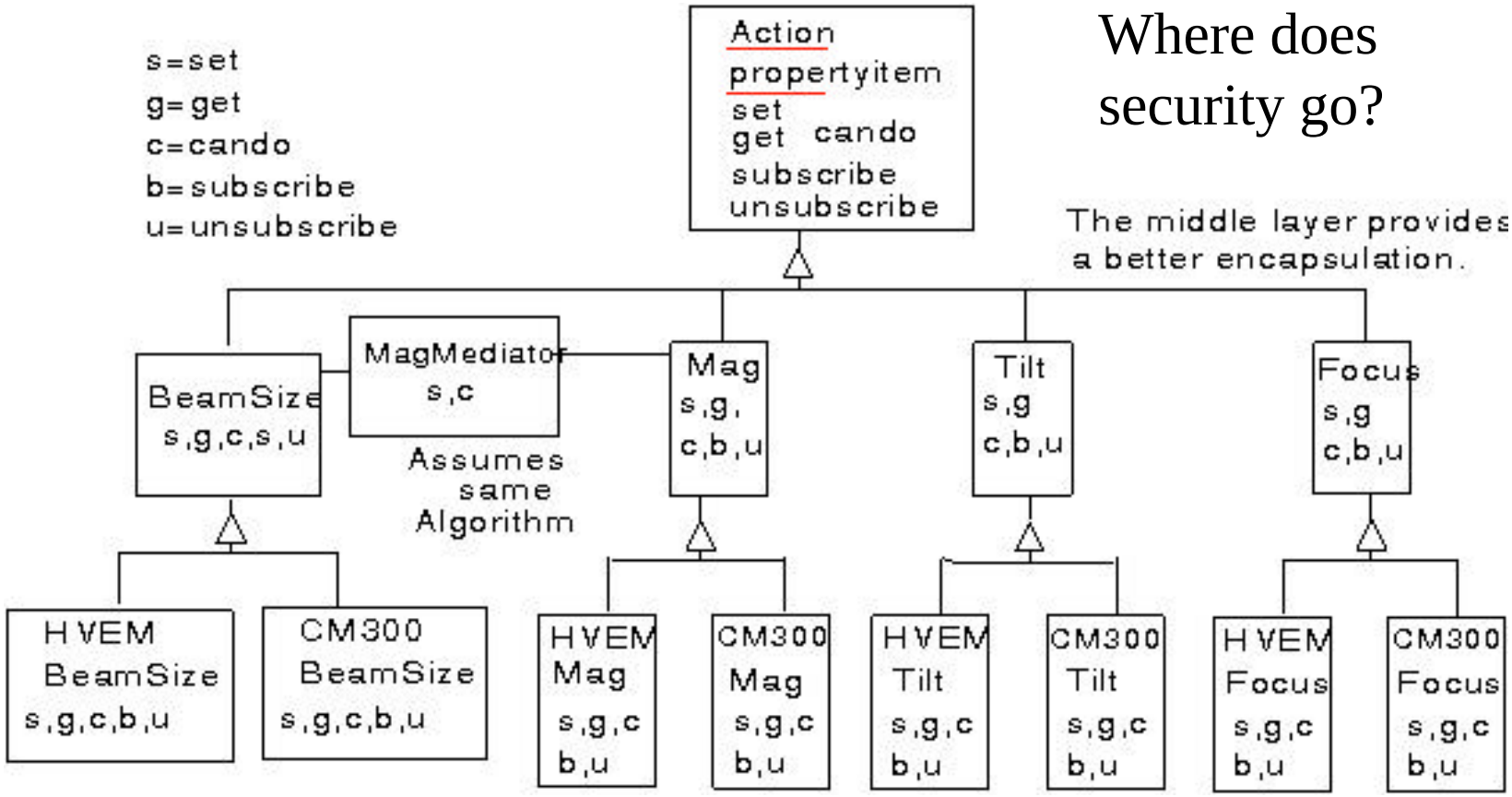
BERKELEY LAB

NIST

ornl

University of Illinois Urbana-Champaign

Total system approach (LBNL)



Where does security go?

ARGONNE National Laboratory

BERKELEY LAB

NIST

ornl

University of Illinois Urbana-Champaign

A multipronged security solution

- Certificates will be used to identify the user and to do basic role-based access (RBAC).
- The user and his role will be sent to the applications controlled by the server as policy engine input.
- We hope to enable authorization certificates
- Working with manufacturers to provide glue between the control API and the hardware

ARGONNE National Laboratory
BERKELEY LAB
NIST
ornl
University of Illinois Urbana-Champaign